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EP 0460886 A1 US 5611802 A US 5342368 A
US 4952213 A

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(54) Abstract Title
Intramedullary bone resection guide

(57) An intramedullary bone resection guide 1 comprising an alignment member comprising a first arm 2 for insertion into the intramedullary canal of a bone and a second arm 5. A cutting guide 3 has a reference surface 6 and a guide surface 12, and an opening 9 in which the second arm 5 of the alignment member can be received so that the cutting guide 3 can slide along the second arm 5. The cutting guide 3 and the second arm 5 incorporate means for restricting rotation of the cutting guide 3 around the second arm 5.

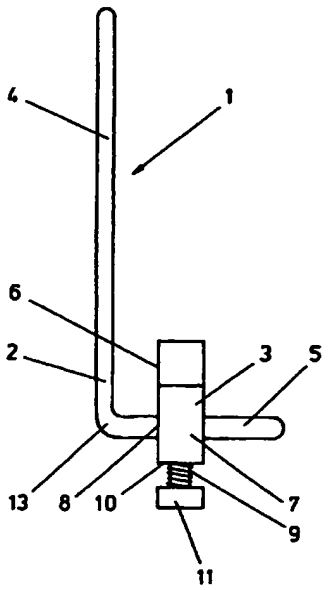

FIG. 1

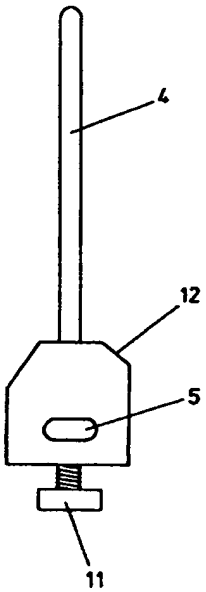

FIG. 2

The reference to figure 5 of the drawings in the printed specification is to be treated as omitted under Section 15(2) or (3) of the Patents Act 1977.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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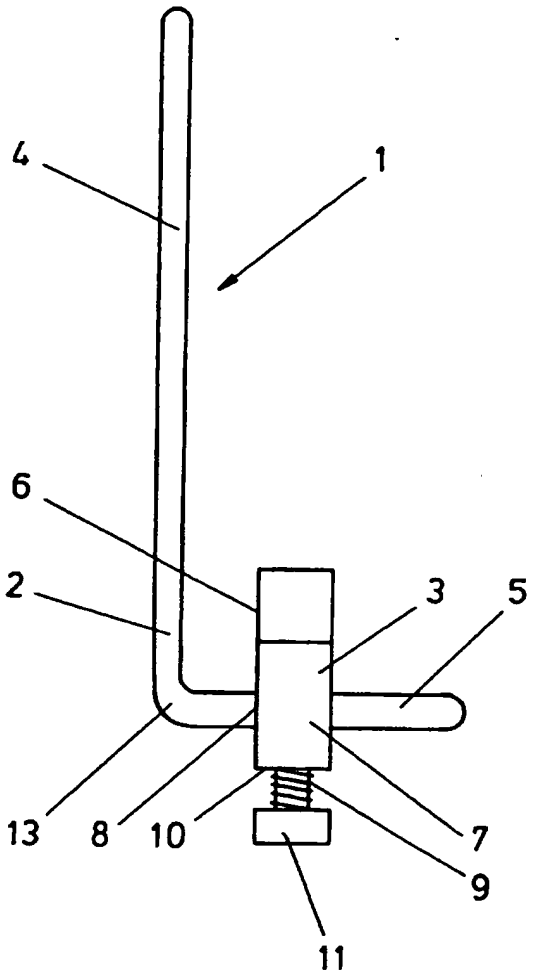

FIG. 1

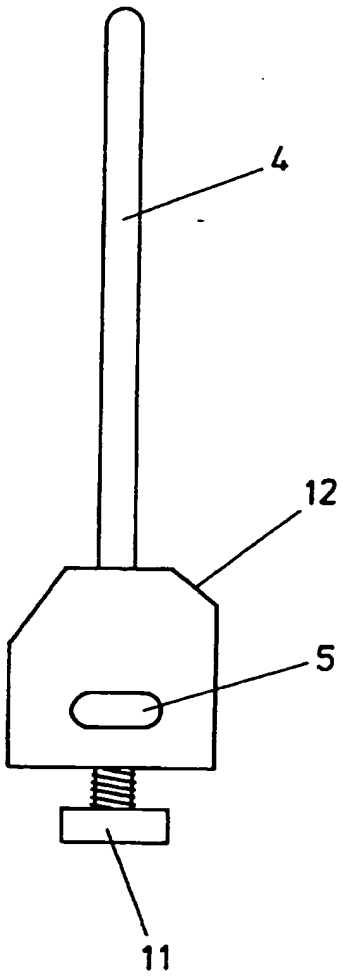

FIG. 2

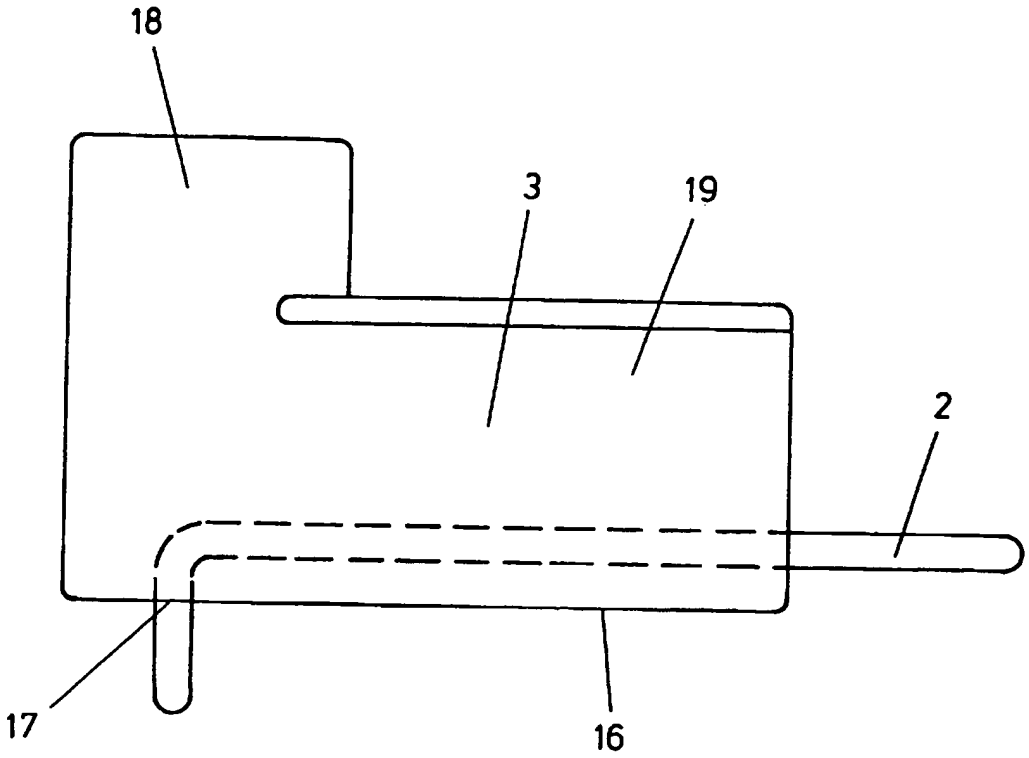

FIG. 3

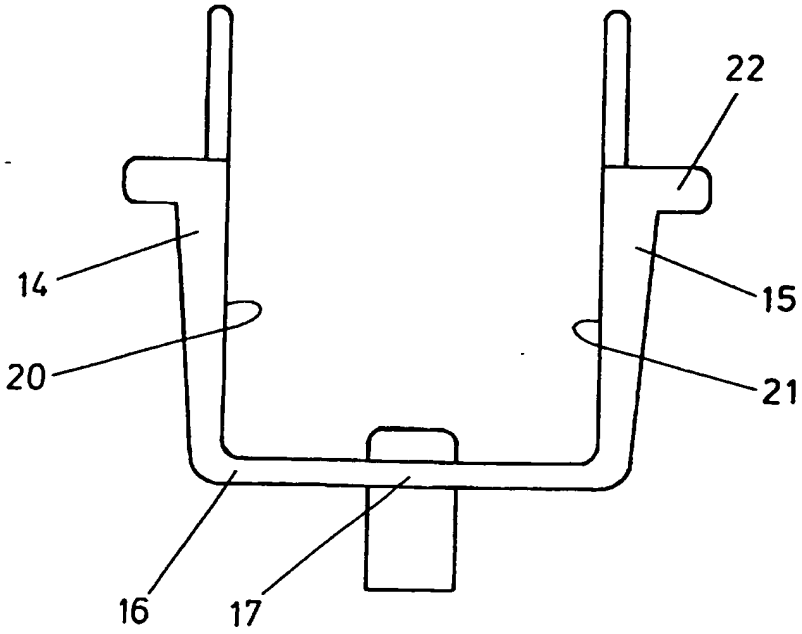

FIG. 4

INTRAMEDULLARY BONE RESECTION GUIDE

The invention relates to an intramedullary bone resection guide.

It is generally important that the location and orientation of prosthetic joint components with respect to natural tissue are controlled accurately during implantation. This control can often require accurate and controlled resection of the natural bone in preparation for the implantation of the prosthesis. Cutting guides are commonly used to help to control the resection. An intramedullary alignment rod can be used to establish proper alignment of a cutting guide with the axis of the bone. However once so aligned, the cutting block must also be located rotationally relative to the bone axis.

EP-A-460886 discloses a device for guiding the resection of the head of a humerus which includes an intramedullary alignment rod. Location rotationally relative to the bone axis is achieved by means of an extramedullary alignment rod which allows the user to locate the device accurately relative using the patient's lower arm as a reference.

It has been found that certain bones in the body provide reference points which can be used to locate a resection guide device rotationally relative to a bone's intramedullary axis.

Accordingly, in one aspect, the present invention provides an intramedullary bone resection guide comprising:

(a) an alignment member comprising a first arm for insertion into the intramedullary canal of a bone and a second arm which extends generally away from the axis defined by the first arm,

(b) a cutting guide having a reference surface and a guide surface, and an opening in which the second arm of

the alignment member can be received so that the cutting guide can slide along the second arm, the cutting guide and the second arm incorporating means for restricting rotation of the cutting guide around the second arm,

the reference surface being a surface of the cutting guide which faces the bone to be resected when the first arm is inserted into the intramedullary canal of the bone so that, when the second arm is received in the opening, the cutting guide can be slid towards the bone until the reference surface contacts predetermined points on the bone so as to stabilise the cutting guide and the alignment member against rotation relative to the axis defined by the first arm, the guide surface then defining the line along which the bone is to be resected.

The use of points on the bone to secure accurate rotational location gives rise to advantages. In particular, the resection guide of the invention can be used to resect bones in joints where alternative references are not available provided that they have appropriately located reference points which can be used to stabilise the cutting guide against rotation relative to the intramedullary axis. It has been found that appropriate reference points are provided towards the distal end of the humerus by posterioral surfaces of the epicondyles to guide resection of the distal end of the humerus for implantation of a component of a prosthetic elbow joint. Appropriate reference points are also provided on the posterioral surfaces of the ulna to guide resection of the ulna for implantation of a component of a prosthetic elbow joint.

The reference points that are used to align the cutting block can be on a surface of the bone that is spaced from joint bearing surfaces. This has the advantage that accurate alignment can be achieved even when the bearing surfaces are damaged, for example as a result of arthritis or trauma.

The guide of the invention also has the advantage that it is simple and relatively inexpensive to manufacture. Furthermore, it is simple to use with very few moving parts, aiding reliable and accurate use.

Preferably, the resection guide includes means for locking the cutting guide in a position along the second arm to prevent it from sliding along the said arm.

Preferably, the second arm of the alignment member has a non-circular cross section. The cross section of the opening in the cutting guide should preferably then have a corresponding shape so that the second arm can only be received in the opening in the cutting guide when the second arm and cutting guide are arranged appropriately relative to one another.

Preferably the first and second arms of the alignment member are arranged substantially perpendicular to one other.

Preferably, the guide surface on the cutting guide is provided by an edge of the reference surface. When the reference surface is in contact with the bone the guide surface will then be in close proximity to the bone surface, facilitating cutting.

The intramedullary bone resection guide can include a cutting guide having first and second reference surfaces on opposite surfaces, the cutting guide providing first and second guide surfaces according to whether it is positioned on the second arm of the alignment member with the first reference surface or the second reference surface facing the bone that is to be resected. One cutting guide can therefore provide more than one guide surface, for example for resecting left and right limbs respectively.

The cutting guide can have a channel like configuration in which the opening for the second arm of the alignment member is

provided in the base of the channel and the bone to be resected is received within the channel when the reference surface contacts the predetermined points on the bone. The channel can be fitted around the bone producing a large area of contact between the bone and the reference surface. This increases the stability of the device in use.

The present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a side elevation of a humeral intramedullary bone resection guide according to the invention;

Figure 2 is a plan view of the humeral intramedullary bone resection guide shown in Figure 1;

Figure 3 is a side elevation of an ulnal intramedullary bone resection guide according to the invention; and

Figures 4 and 5 are views from opposite ends of the resection guide shown in Figure 3.

Referring to the drawings, Figure 1 shows a humeral bone resection guide 1 which comprises an alignment member 2 and a cutting guide 3.

The alignment member 2 comprises a first arm 4 and a second arm 5. The alignment member 2 is manufactured as a single piece of stainless steel or other metallic non-toxic alloy.

The cutting guide 3 is planar, comprising a reference surface 6 and a parallel opposed surface 7. An opening 8 extends between the opposed surfaces 6, 7. The opening is suitable for receiving second arm 5, enabling the cutting guide 3 to slide along the second arm 5 towards the first arm 4.

A threaded opening 9 extends from the base 10 of the cutting

guide 3. A threaded screw 11 is inserted into opening 9. As screw 11 is tightened it extends into the opening 8 and abuts against the second arm 5 so locking the cutting guide 3 in a fixed position relative to the second arm 5.

Figure 2 shows the humeral bone resection guide of Figure 1 along the axis of the second arm 5.

Second arm 5 is elliptical in cross section. The opening 8 is also elliptical and slightly larger than the cross section of the second arm 5. Hence, the second arm 5 will only be received by the opening 8 when the cutting guide 3 and alignment member 2 are in a specific angular alignment.

An edge of the cutting guide 3 comprises a generally arched shaped guide surface 12. The arched guide surface 12 is asymmetric about an axis parallel to the first arm 4 and passing through the second arm 5. The arch is shaped such that by reversing the cutting guide 3 the guide surface can be used to guide the resecting of the humeri of both left and right arms.

When in use, the first arm 4 of the alignment member 2 is inserted into the humeral intramedullary canal until the joint 13 abuts against the end of the humerus. The second arm 5 is then rotated until its axis is approximately perpendicular to the axis of rotation of the elbow joint and faces towards the outside of this joint.

Once the alignment member 2 is approximately aligned the cutting guide 3 is slid onto the second arm 5. Because both the second arm 5 and opening 8 are elliptical the cutting guide 3 will be in the correct angular alignment relative to the humerus.

The cutting guide 3 is slid along the second arm 5 until the reference surface 6 abuts against the humerus. The position of

the reference surface 6 may then be adjusted until it contacts predetermined points on the bone. This ensures that the guide surface is correctly aligned and stabilises it against rotation relative to the axis defined by the first arm.

Once in the correct alignment screw 11 is tightened, locking the cutting guide 3 in correct alignment relative to the second arm 5. By cutting the humerus along the guide surfaces the surgeon will resect the humerus in a plane suitable for engagement with a prosthetic joint.

Shown in Figure 3 is an ulnal resection guide. The resection guide comprises a cutting guide 3 and an alignment member 2, the alignment member having first arm 4 and second arm 5.

The cutting guide 3 is substantially channel like in cross section, having a base 16 and two side walls 14,15 extending from opposite sides of the base in planes substantially perpendicular to the plane of base 16. The base 16 includes a non-circular opening 17 for receiving the non-circular second arm 5 of the alignment member 2. When received in the opening 16 the axis of the first arm 4 of the alignment member 2 is substantially parallel to the base 16 and side walls 14, 15 of the cutting guide 3.

Each of the side walls 14, 15 is substantially L-shaped having a vertical arm 18 and a horizontal arm 19. The axis of the vertical arm extends away from the base substantially parallel to the normal axis to the base. The axis of the horizontal arm 19 extends parallel to the base 16. The base and side walls are formed from a single sheet of non-toxic metal.

Shown in Figure 4 is the ulnal re-section guide of Figure 3 viewed in a plane perpendicular to the base and side walls of the cutting guide. The inner surfaces 20, 21 of the side walls 14, 15 extend in a plane perpendicular to the base 16. The side walls 14, 15 increase in thickness with increasing

distance from the base 16, facilitating gripping by the surgeon during use. A lip 22 extends from the upper edge of each horizontal arm 19 in a plane parallel to the base. The upper edge of lip 22 and the connecting edge of the vertical arm 18 together comprise a guide surface for guiding ulnal resecting.

In use, the first arm 4 of the alignment member 2 is inserted along the ulnal intramedullary canal from the elbow towards the wrist. Once inserted it is rotated until the second arm 5 is aligned perpendicular to the axis of rotation of the elbow joint and faces generally towards the outside of this joint.

The channel like cutting guide 3 is oriented with the channel axis parallel to the ulna. The base 16 is arranged to be on the outside of the elbow joint. The side walls 14, 15 are arranged to extend from the base towards the ulna in planes substantially perpendicular to the axis of rotation of the elbow joint, with the horizontal arm 19 lying on the wrist side of the elbow joint with its axis parallel to the ulna.

The non-circular opening 17 in the base 16 of the cutting guide 3 is aligned with the non-circular second arm 5 of the alignment member 2. The cutting guide 3 is then slid along the second arm 5 until the base 16 abuts against the ulna.

In order to complete the alignment of the cutting guide, the base is rotated about the axis of the first arm until the lip 22 one side of the wall 15 abuts against the lateral epicondyle and simultaneously the lip 22 of the other side 14 abuts against the medial epicondyle, stabilising the cutting guide against rotation.

Cutting along the line defined by the guide surface will cut around the lateral and medial epicondyles suitably resecting the ulna for future engagement with a prosthetic joint.

CLAIMS:

1. An intramedullary bone resection guide comprising:

(a) an alignment member comprising a first arm for insertion into the intramedullary canal of a bone and a second arm which extends generally away from the axis defined by the first arm,

(b) a cutting guide having a reference surface and a guide surface, and an opening in which the second arm of the alignment member can be received so that the cutting guide can slide along the second arm, the cutting guide and the second arm incorporating means for restricting rotation of the cutting guide around the second arm,

the reference surface being a surface of the cutting guide which faces the bone to be resected when the first arm is inserted into the intramedullary canal of the bone so that, when the second arm is received in the opening, the cutting guide can be slid towards the bone until the reference surface contacts predetermined points on the bone so as to stabilise the cutting guide and the alignment member against rotation relative to the axis defined by the first arm, the guide surface then defining the line along which the bone is to be resected.

2. A resection guide as claimed in claim 1, which includes means for locking the cutting guide in a position along the second arm to prevent it from sliding along the said arm.

3. A resection guide as claimed in claim 1 or claim 2, in which the second arm has a non-circular cross-section.

4. A resection guide as claimed in any one of claims 1 to 3, in which the reference surface is substantially planar.

5. A resection guide as claimed in any one of claims 1 to 4, in which the first and second arms of the alignment member are arranged substantially perpendicularly to one another.

6. A resection guide as claimed in any one of claims 1 to 5, in which the guide surface is provided by an edge of the reference surface.

7. A resection guide as claimed in any one of claims 1 to 6, in which the cutting guide has first and second reference surfaces on opposite surfaces, the cutting guide providing first and second guide surfaces according to whether it is positioned on the second arm of the alignment member with the first reference surface or the second reference surface facing the bone that is to be resected.

8. A resection guide as claimed in any one of claims 1 to 7, in which the cutting guide has a channel-like configuration in which the opening for the second arm of the alignment member is provided in the base of the channel when the reference surface contacts the predetermined points on the bone.

The Patent Office

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Application No: GB 9723359.7 **Examiner:** Anwar Gilani
Claims searched: 1-8 **Date of search:** 24 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): A5R (RAT, RECX, REYX)

Int Cl (Ed.6): A61B 17/15

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP0460886 A1	(SMITH & NEPHEW RICHARDS) whole document, particularly col.1 l.51-col.2 l.11, figure 1	1-3,5,6
X	US5611802	(SAMUELSON ET AL) col.8 l.1-18, figure 8	1-3,5,6
X	US5342368	(PETERSEN) col.4 l.62-col.5 l.14, col.7 l.31-43, figure 1	1-3,5,6
X	US4952213	(BOWMAN ET AL) col.3 l.63-col.4 l.21, figures 1,4	1-3,5,6

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.